# بسم الله الرحمن الرحيم


MONA MAGHRABY

# شبكة المعلومات الجامعية

# التوثيق الالكتروني والميكروفيلم

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# جامعة عين شمس

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# قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

# يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

***MONA MAGHRABY***

# The Effect of addition of silver nanoparticles on antibacterial effect, sealing ability and solubility of different root canal sealers.

# (An in vitro study)

Thesis

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By

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# Dedication

This work is dedicated to...

My family who has been a constant source of emotional and moral support in every aspect of my life, this thesis would certainly not have existed without them.

*Mohamed Gamal Farahat*

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# List of Abbreviations

| | |
|---|---|
| **ADA** | American Dental Association |
| **AD-SNP** | ADSeal + SNP |
| **ADT** | Agar Diffusion test |
| **AgVO3** | Silver Vandate |
| **AH** | AH plus |
| **ANSI** | American National Standards Institute |
| **AP** | Apexit plus |
| **BCS** | Bio ceramic Sealer |
| **BHI** | Brain Heart Infusion |
| **CFU** | Colony forming units |
| **CHX** | Chlorohexidine |
| **CsNPs** | Chitosan Nanoparticles |
| **DCT** | Direct contact test |
| **DMAHDM** | Dimethylaminohexadecyl methacrylate |
| **DNA** | Deoxyribonucleic acid |
| **EDTA** | Ethelenediaminetetraacetic acid |
| **ELISA** | Enzyme linked Immunosorbent assay |
| **EN** | Endomethasone |
| **ES** | Experimental sealer |
| **FL** | MTA Fillapex |
| **GF** | GuttaFlow |
| **GF-SNP** | GuttaFlow2 + SNP |
| **HB** | Hybrid root sealer |
| **HGF** | Human Gingival Fibroblast |
| **ICP-MS** | Inductively Coupled Plasma Mass Spectrometry |
| **ISO** | International Standardization Organization |
| **MF-SNP** | MTA Fillapex + SNP |
| **MTA** | Mineral trioxide aggregate |
| **NAg** | Silver Nanoparticles |

| | |
|---|---|
| **NaOCl** | Sodium Hypochlorite |
| **Ni Ti** | Nickel Titanium |
| **PBS** | Phosphate buffer saline |
| **PC** | Portland Cement |
| **PSI** | Pound per square inch |
| **QPEI** | Quaternary Ammonium Polyethyleneimine |
| **RCS** | Real Seal |
| **RSA** | Reokoseal Automix |
| **SEM** | Scanning electron microscope |
| **SNP** | Silver Nanoparticles |
| **SP** | Sealapex |
| **TS** | Tubliseal |

# Introduction

# 1. Introduction

The goal of successful endodontic treatment is to obtain a hermetic seal of the root canal system. The process of endodontic treatment includes mechanical shaping of the canals using endodontic files either manual files or rotary files, cleaning of the root canal system through irrigants and finally obturation of the canal. An inadequate filling during obturation may result in reentry of bacteria and irritation of periapical tissues.

Obturation of the canal is done through using of gutta percha alongside with different root canal sealers. Root canal sealers should meet high biological, physicochemical and mechanical properties to ensure obtaining successful sealing of the root canal system.

Epoxy resin-based sealers are known with their excellent physicochemical properties and sealing ability making them widely used in the field of endodontics.

Although MTA is good as a root filling material, but its physical properties make it hard to be used as root canal sealer. These limitations led to development of MTA-based root canal sealers. Literature show few investigations about the antibacterial effect of those sealers.(1) Trial to add silver nanoparticles to MTA based sealers is very important in order to obtain the excellent mechanical properties and biocompatibility of MTA alongside with gaining antibacterial effect of silver nanoparticles in one material.

Nanomaterials offer unique physicochemical properties such as large surface area/mass ratio, ultrasmall sizes and increased chemical reactivity in comparison with their bulk counterparts. Silver nanoparticles exert their antibacterial effect through acting on multiple targets as altering the hydrogen bonding/respiratory chain, unwind DNA, interaction with the sulfhydryl groups of proteins and DNA and interference with cell wall synthesis and cell division. They also destabilize the bacterial membrane and increase its permeability leading to leakage of cell components.(2)

Many attempts were done to increase the antibacterial effect of the root canal sealers. Additives to sealers may be beneficial to obtain this goal. Recently, silver nanoparticles are widely used in dental field due to its recorded high antibacterial and physic-chemical properties.

This study aimed to investigate the effect of addition of silver nanoparticles to epoxy resin based sealer, MTA based sealer and silicon based sealer in terms of sealing ability, solubility and antibacterial effect. Those three properties play an important role in the success of endodontic treatment. By using silver nanoparticles, we aimed to gain benefit from its physicochemical properties and antibacterial effect to enhance the properties of root canal sealers.